2. (Amended) The [composition] superconducting apparatus of claim 1, further including an alkaline earth element substituted for at least one atom of said rare earth or rare earth-like element in said composition.

27. (Amended) A superconducting apparatus comprising a composition having a transition temperature in excess of 26°K, said composition being a substituted Cu-oxide including a superconducting phase having a structure which is structurally substantially [close] similar to the orthorhombic-tetragonal phase transition of said composition means for maintaining said composition at a temperature greater than said transition transition temperature to put said composition in a superconducting state; and means for passing current through said composition while in said superconducting state.

32. (Amended) The [composition] superconducting apparatus of claim 31, where said crystalline structure is layer-like, enhancing the number of Jahn-Teller polarons in said composite.

33. (Amended) A superconducting apparatus comprising a composition having a superconducting onset temperature in excess of 26°K[.], the composition being comprised of a copper oxide doped with an alkaline earth element where the concentration of said alkaline earth element is near to the concentration of said alkaline earth element where the superconducting copper

oxide phase in said composition undergoes an orthorhombic to tetragonal structural phase transition.

48. (Amended) A superconductive apparatus comprising a superconductive composition comprised of a transition metal oxide having substitutions therein, the amount of said substitutions being sufficient to produce sufficient electron-phonon interactions in said composition that said composition exhibits a superconducting onset at temperatures greater than 26°K[.], and a source of current for passing a superconducting electric current through said superconductor.

59. (Amended) A combination, comprised of:

a ceramic-like material having an onset of superconductivity at an onset temperature in excess of 26°K[.],

means for passing a superconducting electric current through said ceramic-like material while said material is maintained at a temperature in excess of 26°K and less than said onset temperature, and

means for cooling said superconducting ceramic-like material to a superconductive state at a temperature greater than 26°K and less

than said onset temperature, said material being superconductive at temperatures below said onset temperature and a ceramic at temperatures above said onset temperature.

60. (Amended) [A superconductor] <u>An apparatus</u> comprised of a transition metal oxide, and at least one additional element, said superconductor having a distorted crystalline structure characterized by an oxygen deficiency and exhibiting a superconducting onset temperature in excess of 26°K[.]<u>, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature in excess of 26°K.</u>

61. (Amended) The [superconductor] <u>apparatus</u> of claim 60, where said transition metal is Cu.

62. (Amended) [A superconductor] <u>An apparatus</u> comprised of a transition metal oxide and at least one additional element, said superconductor having a distorted crystalline structure characterized by an oxygen excess and exhibiting a superconducting onset temperature in excess of 26°K [.]<u>, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature in excess of 26°K.</u>

63. (Amended) The [superconductor] <u>apparatus</u> of claim 62, where said transition metal is Cu.

65. (Amended) [A superconducting] <u>An apparatus</u> composition exhibiting superconductivity at temperatures greater than 26°K, said composition being a ceramic-like material in the RE-AE-TM-O system, where RE is a rare earth or near rare earth element, AE is an alkaline earth element, TM is a multivalent transition metal element having at least two valence states in said composition, and O is oxygen, the ratio of the amounts of said transition metal in said two valence states being determined by the ratio RE : AE [.]<u>, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature in excess of 26°K.</u>

66. (Amended) [A superconductive] <u>An apparatus</u> composition having a transition temperature greater than 26°K, the composition including a multivalent transition metal oxide and at least one additional element, said composition having a distorted orthorhombic crystalline structure[.]<u>, a source of current for passing a superconducting electric current in said transition metal oxide, and a cooling apparatus for maintaining said transition metal oxide below said onset temperature and at a temperature in excess of 26°K.</u>

67. (Amended) The [composition] <u>apparatus</u> of claim 66, where said transition metal oxide is a mixed copper oxide.

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68. (Amended) The [composition] <u>apparatus</u> of claim 67, where said one additional element is an alkaline earth element.

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83. (Amended) The method of claim 82[.], where said transition metal is copper.

E

96. (Amended) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature in excess of 26 K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition [consisting essentially of] <u>comprising</u> a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductor transition temperature T_c of greater than 26 K;

(b) means for maintaining the superconductor element at a temperature above 26 K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) means for causing an electric current to flow in the superconductor element.

97. (Amended) The superconductive [method] <u>apparatus</u> according to claim 96 in which the copper-oxide compound of the superconductive composition includes at least one rare-earth or rare-earth-like element and at least one alkaline-earth element.

98. (Amended) The superconductive [method] <u>apparatus</u> according to claim 97 in which the rare-earth or rare-earth-like element is lanthanum.

99. (Amended) The superconductive [method] <u>apparatus</u> according to claim 97 in which the alkaline-earth element is barium.

100. (Amended) The superconductive [method] <u>apparatus</u> according to claim 96 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

101. (Amended) The superconductive [method] <u>apparatus</u> according to claim 100 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

E8 cncld

102. (Amended) The superconductive [method] apparatus according to claim 101 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

104. (Amended) The superconductive [method] apparatus according to claim 103 in which the rare-earth or rare-earth-like element is lanthanum.

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105. (Amended) The superconductive [method] apparatus according to claim 103 in which the alkaline-earth element is barium.

106. (Amended) The superconductive [method] apparatus according to claim 103 in which the copper-oxide compound of the superconductive composition includes mixed valent copper ions.

107. (Amended) The superconductive [method] apparatus according to claim 106 in which the copper-oxide compound includes at least one element in a nonstoichiometric atomic proportion.

108. (Amended) The superconductive [method] apparatus according to claim 107 in which oxygen is present in the copper-oxide compound in a nonstoichiometric atomic proportion.

111. (Amended) A device comprising a superconducting transition metal oxide having a superconductive onset temperature greater than 26°K, said superconducting transition metal oxide being at a temperature less than said superconducting onset temperature and having a [superconduting] <u>superconducting</u> current flowing therein.

121. (Amended) A [structure] <u>device</u> comprising a copper oxide having a T_c greater than 26°K carrying a superconducting current.

125. (Amended) [A structure] <u>An apparatus</u> comprising a composition of matter having a T_c greater than 26°K carrying a superconducting current said composition comprising at least one each of a III B element, an alkaline earth, and copper oxide.

126. (Amended) A [structure] <u>device</u> comprising a composition of matter having a T_c greater than 26°K carrying a superconducting current, said composition comprising at least one each of a rare earth, and copper oxide.

127. (Amended) A [structure] <u>device</u> comprising a composition of matter having a T_c greater than 26°K carrying a superconducting current, said composition comprising at least one each of a III B element, and copper oxide.

E2 cont'd

128. (Amended) A transition metal oxide device comprising a $T_c > 26°K$ and carrying a superconducting current.

129. (Amended) A copper oxide device comprising a $T_c > 26°K$ and carrying a superconducting current.

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137. (Amended) An apparatus comprising:

[forming] a composition including a transition metal, a rare earth or Group III B element, an alkaline earth element, and oxygen, where said composition is a mixed transition metal oxide having a non-stoichimetric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than 26°K,

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means for maintaining said composition in said superconducting state at a temperature greater than 26°K, and less than said superconducting onset temperature, and

means for passing an electrical current through said composition while said composition is in said superconducting state.

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146. (Amended) [A method, including the steps of] An apparatus:

a composition exhibiting a superconductive state at a temperature in excess of 26°K,

a temperature controller maintaining said composition at a temperature in excess of 26°K at which temperature said composition exhibits said superconductive state, and

a current source passing an electrical current through said composition while said composition is in said superconductive state.

147. (Amended) The [method] apparatus of claim 146, where said composition is comprised of a metal oxide.

148. (Amended) The [metal] apparatus of claim 146, where said composition is comprised of a transition metal oxide.

163. (Amended) An apparatus comprising [the steps of]:

a composition including copper, oxygen and any element selected from the group consisting of a Group II A element, a rare earth element and a Group III B element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

167. (Amended) An apparatus comprising:

a copper oxide having a phase therein which exhibits a superconducting state at a critical temperature in excess of 26°K;

a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

E16 Cncld

said copper oxide includes [at least one] an element selected from the group consisting of a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element.

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173. (Amended) An apparatus comprising:

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a composition including a transition metal, oxygen and an element selected from the group consisting of [at least one] a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, where said composition is a mixed transitional metal oxide formed from said transition metal and said oxygen, said mixed transition metal oxide having a non-stoichiometric amount of oxygen therein and

exhibiting a superconducting state at a temperature greater than 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

174. (Amended) [A method including the steps of] An apparatus:

forming a composition exhibiting a superconductive state at a temperature in excess of 26°K;

a temperature controller maintaining said composition at a temperature in excess of 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

superconductor transition T_c of the superconductive composition; and

E27 Cncl'd

(c) a current source causing an electric current to flow in the superconductor element.

177. (Amended) An apparatus comprising:

a copper oxide having a phase therein which exhibits a superconducting state at a critical temperature in excess of 26°K;

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a temperature controller maintaining the temperature of said material at a temperature less than said critical temperature to produce said superconducting state in said phase;

a current source passing an electrical supercurrent through said copper oxide while it is in said superconducting state;

said copper oxide includes at least one [element selected from group consisting of a] Group II A element, <u>and</u> at least one element selected from the group consisting of a rare earth element and [at

least one element selected from the group consisting of] a Group III B element.

178. (Amended) An apparatus comprising:

a composition including copper, oxygen [and an element selected from the group consisting of at least one], a Group II A element and at least one element selected from the group consisting of a rare earth element [at least one element selected from the group consisting of] and a Group III B element, where said composition is a mixed copper oxide having a non-stoichiometric amount of oxygen therein and exhibiting a superconducting state at a temperature greater than 26°K;

a temperature controller maintaining said composition in said superconducting state at a temperature greater than 26°K; and

a current source passing an electrical current through said composition while said composition is in said superconducting state.

179. (Amended) A structure comprising:

a composition exhibiting a superconductive state at a temperature in excess of 26°K;

a temperature controller maintaining said composition at a temperature in excess of 26°K at which temperature said composition exhibits said superconductive state;

a current source passing an electrical current through said composition while said composition is in said superconductive state; and

said composition including a copper oxide [and at least one element selected from the group consisting of], a Group II A element, at least one element selected from the group consisting of a rare earth element and [at least one element selected from the group consisting of] a Group III B element.

180. (Amended) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature in excess of 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the composition having a superconductive transition temperature T_c of greater than 26°K, said superconductive composition includes [at least one element selected from the group consisting of] a Group II A element, <u>and</u> at least one element selected from the group consisting of a rare earth element and [at least one element selected from the group consisting of] a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature above 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

181. (Amended) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a layer-type perovskite-like crystal structure, the copper-oxide compound including [at least one element selected from the group consisting of a group] Group II A element, and at least one element selected from the group consisting of a rare earth element and [at least one element selected from the group consisting of] a Group III B element, the composition having a superconductive-resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

182. (Amended) An apparatus comprising [providing] a composition having a transition temperature greater than 26°K, the composition including a rare earth or alkaline earth element, a transition metal element capable of exhibiting multivalent states and oxygen, including at least one phase that exhibits superconductivity at temperature in excess of 26°K, a temperature controller maintaining said composition at said temperature to exhibit said superconductivity and a current source passing an electrical superconducting current through said composition with said phrase exhibiting said superconductivity.

E18 Cond

183. (Amended) An apparatus comprising [providing] a superconducting transition metal oxide having a superconductive onset temperature greater than 26°K, a temperature controller maintaining said superconducting transition metal oxide at a temperature less than said superconducting onset temperature and a current source flowing a superconducting current therein.

187. (Amended) An apparatus comprising [flowing] a superconducting electrical current in a transition metal oxide having a T_c greater than 26°K and maintaining said transition metal oxide at a temperature less than said T_c.

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199. (Amended) The superconductive apparatus according to claim 198 in which the copper-oxide compound of the superconductive composition includes at least one element selected from the group consisting of a rare-earth element [and], a Group III B element and [at least one] an alkaline-earth element.

200. (Amended) The superconductive apparatus according to claim 199 in which the rare-earth [or rare-earth-like element] is lanthanum.

205. (Amended) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including at least one element selected from the group consisting of a rare-earth element [and], a Group III B element and [at least one] an alkaline-earth element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a

lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$, the transition-onset temperature T_c being greater than 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{p=0}$ of the superconductive composition; and

Entered

(c) a current source causing an electric current to flow in the superconductor element.

213. (Amended) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature in excess of 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature T_c of greater than 26°K, said superconductive composition includes [at least one element selected from the group consisting of] a Group II A element and at

least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature above 26°K and below the superconductor transition temperature T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

214. (Amended) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a copper-oxide compound having a substantially layered perovskite crystal structure, the copper-oxide compound including [at least one element selected from the group consisting of] a Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element, the composition having a superconductive/resistive transition

defining a superconductive-resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

Entered

(c) a current source causing an electric current to flow in the superconductor element.

215. (Amended) A superconductive apparatus for causing electric-current flow in a superconductive state at a temperature in excess of 26°K, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal oxide compound having a substantially layered perovskite crystal structure, the composition having a superconductive transition temperature T_c of greater than 26°K, said superconductive composition includes [at least one

element selected from the group consisting of a] Group II A element and at least one element selected from the group consisting of a rare earth element and a Group III B element;

(b) a temperature controller maintaining the superconductor element at a temperature above 26°K and below the superconductor transition T_c of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

216. (Amended) A superconductive apparatus for conducting an electric current essentially without resistive losses, comprising:

(a) a superconductor element made of a superconductive composition, the superconductive composition consisting essentially of a transition metal-oxide compound having a substantially layered perovskite crystal structure, the transition metal-oxide compound including [at least one element selected from the group consisting of] a Group II A element and at least one element selected from the group consisting of a rare earth element

and a Group III B element, the composition having a superconductive/resistive transition defining a superconductive/resistive-transition temperature range between an upper limit defined by a transition-onset temperature T_c and a lower limit defined by an effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$, the transition-onset temperature T_c being greater than 26°K;

(b) a temperature controller maintaining the superconductor element at a temperature below the effectively-zero-bulk-resistivity intercept temperature $T_{\rho=0}$ of the superconductive composition; and

(c) a current source causing an electric current to flow in the superconductor element.

231. (Added) An apparatus comprising a composition of matter having a T_c greater than 26°K carrying a superconducting current, said composition comprising at least one each of a rare earth, an alkaline earth, and copper oxide.

REMARKS

Reconsideration is respectfully requested in view of any changes to the claims and the remarks herein. Please contact the undersigned to conduct a telephone interview in accordance with MPEP 713.01 to resolve any remaining requirements and/or issues prior to sending another Office Action. Relevant portions of MPEP 713.01 are included on the signature page of this amendment.

Claims 1-230 are currently pending. The examiner states that "Claims 2-11, 32, 39, 47-54, 60-63, 65-68, 73-76, 82, 83, 87-90, 97-102, 104-108, 110, 117, 118, 121, 122 and 125-129 remain withdrawn from consideration as directed to non-elected inventions." Applicants respectfully disagree that all these claims should be nonelected. Some of the dependent claims have antecedent basis problems which have been corrected in this amendment. Claims 2-11 depend from claim 1 which is under examination. Claim 32 depends from claim 31 which is under examination. Claim 39 depends from claim 36 which is under examination. Claim 47 depends from claim 46 which is under examination. Independent claims 48 is directed to an apparatus and applicants believe that this should be examined with the other claims under examination. Claims 49-54 depend from claim 48. Claims 60-63 and 65-68 have been amended to be directed to an apparatus. Claims 97-102 depend from claims 96 which is under examination. Claims 104-108 depend from claim

103 which is under examination. Claim 110 depends from claim 15 which is under examination. Claims 128-130 have been amended to be directed to a device. Claims 73-76, 82-83, 117, 118, and 126 have been amended to be directed to a device. Claims 146-148 and 174 are amended to be directed to an apparatus.

Applicants acknowledge the withdrawal of the 112, 1st paragraph, rejection of claims 115, 116, 119, 120 and 124 in view of the amendments and remarks in applicants' prior response.

CLAIM OF PRIORITY

Since the examiner has not addressed applicants claim to priority from the priority document, applicants understand that the examiner has granted applicants claim to priority.

REJECTIONS UNDER 35 USC 102 AND 103

Applicants acknowledge the withdrawal of the prior art rejection over Asahi Shinbum, International Satellite Edition (London), November 28, 1986 (hereinafter, "the Asahi Shinbum article") in view of the remarks in applicants' prior response. The examiner states "Upon careful consideration, the examiner

agrees with applicant's position appearing at pages 34-39 of the supplemental response filed 8/5/99. Specifically, applicant has sufficiently demonstrated conception, diligence and reduction to practice of the instant invention before the publication date of the Asahi Shinbum article." Applicants disagree "that the withdrawn of the prior art rejection addresses each of applicant's remarks appearing at pages 1-46 of the supplemental response filed 8/5/99 (paper #25). Applicants respectfully submit that the examiner has not withdrawn the rejection but has found the rejection moot in view of the fact that the examiner has agreed that applicant has sufficiently demonstrated conception before the publication date of the Asahi Shinbum article in the United States and diligence to a reduction to practice of the instant invention.

The examiner has not commented on nor rebutted applicants' argument that in rejecting claims under 35 USC 102 and 103 over the Asahi Shinbum article, the examiner necessarily concludes that applicants' claims are fully enabled. The Asahi Shinbum article refers to applicants' work which was reported in their original article which is incorporated by reference in applicants' specification. Since applicants' original article is the only information enabling the Asahi Shinbum article, it logically follows that the examiner necessarily concludes that all applicants' claims are fully enabled.

In the Office Action of 7-30-98 claims have been rejected as anticipated under 35 USC 102(a) by the Asahi Shinbum article, and claims have been rejected as obvious under 35 USC 103(a) in view of the Asahi Shinbum article. These rejections have not in fact been withdrawn, but, as stated above, have in fact been found to be moot.

Thus in the Office Action of 7-30-98, the Examiner is stating that everything within applicants' non-allowed claims rejected under 35 USC 102 over this article, is found in the Asahi Shinbum article and a person of skill in the art can practice the invention of applicants' claims rejected under 35 USC 102 with what is taught in the Asahi Shinbum article alone. Moreover, in the Office Action, the examiner is stating that all the claims rejected under 35 USC 103 over the Asahi Shinbum article alone can be practiced by a person of skill in the art with what is taught in the Asahi Shinbum article in combination with what is known to a person of skill in the art. All of applicants' claims rejected over the Asahi Shinbum article are dominant to (or generic to) the one claim, claim 123, allowed in the Office Action of 7-30-98. Thus by stating that all the non-allowed claims are anticipated or obvious over the Asahi Shinbum article alone, the Examiner is stating that a person of skill in the art needs nothing more that what is taught in the Asahi Shinbum article or what is taught therein in combination with what is known to a person of skill in the art to practice that part of each of applicants non-allowed claims which does not overlap allowed claim 123. Thus,

it logically follows from the 35 USC 102/103 rejections that all of applicants' claims are fully enabled.

The Asahi Shinbum article states in the first paragraph:

> A new ceramic with a very high T_c of 30K of the superconducting transition has been found. The possibility of high T_c - superconductivity has been reported by scientists in Switzerland this spring. The group of Prof. Shoji TANAKA, Dept. Appl. Phys. Faculty of Engineering at the University of Tokyo confirmed in November, that this is true.

and in the second paragraph:

> The ceramic newly discovered, is an oxide compound of La and Cu with Barium which has a structure of the so-called perovskite and shows metal-like properties. Prof. Tanaka's laboratory confirmed that this material shows diamagnitism (Meisner effect) which is the most important indication of the existence of superconductivity.

The Swiss scientist are the inventors of the present application. Thus this clearly refers to applicants work which was reported in applicants' article which is incorporated by reference in the present application. These passages say that Prof. Tanaka confirmed applicants work. The newly discovered ceramic referred

to in the article is the ceramic reported on in applicants' article. It is thus clear that for the examiner to have rejected applicants claim over the Asahi Shinbum article under 35 USC 102 or 35 USC 103, the examiner necessarily had to find that applicants' article fully enabled their claims.

In the Office Action the examiner has not commented on nor rebutted these arguments. In applicants' response dated 8-2-99 applicants apply these arguments in detail to the rejection of applicants claims under 35 USC 102 and 35 USC 103, respectively. The examiner, therefore, must be taken to agree with applicants argument in the prior response that their teaching has fully enabled all of their claims.

At the beginning of applicants' arguments in regard to the objections and rejection based on 35 USC 112, first paragraph, applicants' have repeated these arguments, that is that the 35 USC 102/103 rejections over the Asahi Shinbum article logically requires that all of applicants' claims are fully enabled by applicants' teaching. The examiner has again not responded nor rebutted them. The examiner, therefore, must be taken to agree with applicants argument in the response of 8-2-99 that their teaching has fully enabled all of their claims.

The examiners rejections under 35 USC 102 and 103 over the Asahi Shinbum articles have been maintained since the Office Action dated August 26,

1992 of the parent application. Thus the examiner has maintained the view that all of applicants' claims are fully enabled for about eight years. Thus the specification provides an enabling disclosure of all of applicants' claims.

OBJECTION TO SPECIFICATION AND REJECTION OF CLAIMS UNDER 35 USC 112, FIRST PARAGRAPH

The only support for the objection to the specification and rejection of claims as not enabled under 35 USC 112, first paragraph, is the examiner's unsupported statement that the field of high Tc superconductivity is unpredictable, the examiner's unsupported statement that the theoretical mechanism of superconductivity in these materials was not well understood, and examples in applicants' specification that show metal oxides having a $Tc < 26°K$. One of these examples has an onset at 26°K. The examiner provides no extrinsic evidence to support the examiner's position of nonenablement. Applicants have submitted five affidavits of experts rebutting the examiner's position of nonenablement, the article by Rao et al. and the book by Poole et al. which clearly states that it is easy to fabricate high Tc materials. Moreover, the book by Poole, the Affidavit of Duncombe and the article by Rao shows numerous examples of high Tc metal oxides fabricated according to applicants' teaching which do not fall within the scope of the claims allowed by the examiner but do fall within the scope of the claims which have not been allowed by the

examiner. The examiner has not rebutted applicants' application of case law which holds that 35 USC 112, first paragraph, permits claims to read on inoperable species. Notwithstanding, applicant's claims do not read on any inoperative species. Under In re Angstadt 190 USPQ 219, to sustain a rejection under 35 USC 112, first paragraph, it is the examiner's burden to show that a person of skill in the art must engage in undue experimentation or require ingenuity beyond that expected of a person of skill in the art to practice the claimed invention. According to In re Wands 8 USPQ2d 1400, an application does not fail to meet the 35 USC 112 enablement requirement even though experimentation is needed to determine samples useful to practice the claimed invention when the experimentation is not undue. The examiner has not meet his burden under 35 USC 112, first paragraph, as articulated in In re Angstadt and In re Wands. Moreover under In re Angstadt, providing the examples in applicants' specification with a Tc < 26°K is commendable frankness and part of applicants' teaching on how to select a high Tc material. In re Angstadt and In re Wands hold that a claim is enabled if undue experimentation is not needed to determine if a particular species with in the scope of the claim is effective to practice the claimed invention. This is the situation in the present application and the examiner has not rebutted applicants' showing that only routine experimentation is needed to fabricate materials useful to practice applicants' invention. It is applicants' view that there can be no question that the record as a whole supports applicants' view that all the claims are fully enabled. Thus,

applicants request the examiner to withdraw the objection to the specification and the rejection of claims under 35 USC 112, first paragraph.

The examiner states:

The specification is objected to under 35 U.S.C. § 112, first paragraph, as failing to provide an enabling disclosure commensurate with the scope of the claims.

In support of this statement the examiner states:

The present specification is **deemed** to be enabled only for compositions comprising a transition metal oxide containing at least a) an alkaline earth element and b) a rare-earth element or Group III B element. The art of high temperature (above 30'K) superconductors is an extremely unpredictable one. Small changes in composition can result in dramatic changes in or loss of superconducting properties. The amount and type of examples necessary to support broad claims increases as the predictability of the art decreases. Claims broad enough to cover a large number of compositions that do not exhibit the desired properties fail to satisfy the requirements of 35 U.S.C. 112. Merely reciting a desired result does not overcome this failure. In particular, the

question arises: Will any layered perovskite material exhibit superconductivity.

A large number of examples are needed to support a broad claim in an unpredictable art only if a person of skill in the art has to engage in undue experimentation to determine embodiments not specifically recited in applicants' teachings. It is the examiner's burden to show that undue experimentation is necessary. The examiner has presented no extrinsic evidence that a person of skill in the art would have to engage in undue experimentation. The examiner has stated without support that the art of high temperative superconductivity is an extremely unpredictable one. Applicants have not merely stated a desired result as clearly shown by the five affidavits submitted by experts in the field, the Poole book and the Rao article (Attachment C). And it is not necessary for any layered perovskite to work to satisfy 35 USC 112, first paragraph, it is only necessary that they can be determined without undue experimentation.

The examiner restates without support that "It should be noted that at the time the invention was made, the theoretical mechanism of superconductivity in these materials was not well understood. That mechanism still is not understood." Applicants note that the theory of superconductivity has been understood for some time. For example, the book by Von Laue entitled "Superconductivity", published in English in 1952, presents a comprehensive

theory of superconductivity. The entire text of this book is included in Attachment A. Notwithstanding, for a claim to be enabled under section 112, it does not require an understanding of the theory. The examiner then conclusorily states "Accordingly, there appears to be little factual or theoretical basis for extending the scope of the claims much beyond the proportions and materials actually demonstrated to exhibit high temperature superconductivity". This statement is clearly inconsistent with In re Angstadt 190 USPQ 219 and In re Wands 8 USPQ2d 1400 which hold that to satisfy the first paragraph of 35 USC 112 it is only necessary that a person of skill in the art not exercise undue experimentation to make samples that come within the scope of the applicants' claims. Applicants have clearly shown that only routine experimentation is needed to fabricate samples to practice applicants claimed invention. The examiner has not denied, nor rebutted this. The examiner again incorrectly cites Brenner v. Manson, 383 US 519, 148 USPQ 689. stating a "patent is not a hunting license. It is not a reward for the search, but a reward for its successful conclusion". As stated in the applicants' prior response, this quote applies to utility (a requirement under 35 USC 101) not to enablement (a requirement under 35 USC 112) and is thus incorrectly cited by the examiner.

Claims 1, 12-31, 33-38, 40-46, 55-59, 64, 69-72, 84-86, 91 , 96, 109, 111, 112, 115, 116, 119, 120, 130-133, 137-139, 141-144, 149, 153-155, 162-169, 172-173, 175-184, 187-188, 192-196, 198-219, 222-223 and 227-230 have been

rejected under 35 U.S.C. § 112, first paragraph, for the reasons set forth in the objection to the specification. In view of the changes to the claims and the remarks herein the examiner is respectfully requested to withdraw this rejection.

Applicants acknowledge that the above 112, first paragraph, rejection has been modified in scope from the last Office Action.

The examiner states:

> Upon careful consideration of the evidence as a whole, including the specification teachings and examples, and applicant's affidavits and remarks, the examiner has determined that the instant specification is enabled for compositions comprising a copper oxide containing an alkaline earth element and a rare-earth or Group III B element (as opposed to only compositions comprising $Ba_xLa_{5-x}Cu_50_Y$. as stated in the last Office action). Applicant has provided guidance throughout the instant specification that various copper oxides containing an alkaline earth element and a rare-earth or Group III B element result in superconductive compounds which may in turn be utilized in the instantly claimed apparatus.

Applicants disagree that they have only enabled compositions containing an alkaline earth element and a rare earth or Group III B element to result in superconductive compounds which may in turn be utilized in the instantly claimed methods. There are numerous examples of high Tc superconductors made using the general principals of ceramic science as taught by applicants. There principals that existed prior to applicants' earliest filing date.

The examiner further states:

With respect to the remaining claims, applicant's remarks filed 8/5/99 have been fully considered. It is believed that applicant's position has been fully addressed in the previous office actions, however, the examiner would like to reiterate the following.

Applicants have submitted three affidavits attesting to the applicants' status as the discoverers of materials that superconduct > 26°K. Each of the affidavits states that "all the high temperature superconductors which have been developed based on the work of Bednorz and Muller behave in a similar manner (way)". Each of the affidavits add "(t)hat once a person of skill in the art knows of a specific transition metal oxide composition which is superconducting above 26°K, such a person of skill in the art, using

> the techniques described in the (present) application, which includes all- known principles of ceramic fabrication, can make the transition metal oxide compositions encompassed by (the present) claims ... without undue experimentation or without requiring ingenuity beyond that expected of a person of skill in the art.

The examiner has incorrectly stated that applicants have produced three affidavits. Applicants have produced five affidavits of affiants who are employed at the IBM, Thomas J. Watson Research Center. The affidavits of Shaw and Duncombe were referred to in applicants previous amendment. The affidavits of Mitzi, Dinger, Tsuei, Shaw and Duncombe and the book of Poole et al. state it is straight forward to use the general principles of ceramic science to make high T_c transition metal oxide superconductors following applicants' teaching. The book of Poole et al. and the affidavit of Duncombe show numerous example of high Tc superconductors produced according to applicants' teaching. The affidavits of Shaw and Duncombe cites numerous books and articles which provide the general teaching of ceramic science at the time of and prior to the filing date of the present application. The affidavit of Duncombe also provides several hundred pages copied from Mr. Duncombe's notebooks starting from before applicants' filing date showing the fabrication of numerous samples. In regards to these pages, Mr. Duncombe states "I have recorded research notes relating to superconductor oxide (perovskite) compounds in technical notebook IV with

entries from November 12, 1987 to June 14, 1998 and in technical notebook V with entries continuing from June 7, 1988 to May 1989." Mr. Duncombe's affidavit list some of the compounds prepared using the general principles of ceramic science: $Y_1 Ba_2 Cu_3 O_x$; $Y_1 Ba_2 Cu_3 O_3$; $Bi_{2.15} Sr_{1.98} Ca_{1.7} Cu_2 O_{\delta+8}$; $Ca_{(2-x)} Sr_x Cu O_x$ and $Bi_2 Sr_2 Cu O_x$. Applicants note that the last three examples do not come within the scope of the claims allowed by the examiner since they do not contain a rare earth or group III B element. The examiner has not commented on the data in Mr. Duncombe's affidavit. Mr. Duncombe's affidavit provides direct evidence that these examples were made following applicants' teaching without undue experimentation. Moreover, the preface of the Poole article states in part at A3: "The unprecedented worldwide effort in superconductivity research that has taken place over the past two years has produced an enormous amount of experimental data on the properties of the copper oxide type materials that exhibit superconductivity above the temperature of liquid nitrogen. ... During this period a consistent experimental description of many of the properties of the principal superconducting compounds such as BiSrCaCuO, LaSrCuO, TlBaCaCuO. and YBaCuO has emerged". The first and third of these compositions does not come within the scope of the claims allowed by the examiner since they do not contain a rare earth or group III B element, even though Poole states that they are easy to make following the general principals of ceramic science as taught by applicants. Other data supporting applicants view is reported in the Review Article "Synthesis of Cuprate Superconductors" by

Rao et al., IOP Publishing Ltd. 1993. A copy of this article is in Attachment C. This article lists in Table 1 the properties of 29 superconductors made according to applicants teaching. Twelve (#'s 1, 8-13, 16, 17, 20, 21, 27 and 28) of those listed do not come within the scope of the claims allowed by the examiner. Only three of the 29 have a Tc < 26°K. Those twelve do not contain one or more of a rare earth, a group III B element or an alkaline earth element. It is thus clear that broader claims than allowed should be allowed since it is clear that the allowed claims can be avoided following applicants teaching without undue experimentation. Applicants are entitled to claims which encompass these materials since they were made following applicants' teaching.

The article of Rao et al. in the first sentence of the introduction citing applicants' article - which is incorporated by reference in their application - acknowledges that applicants initiated the field of high Tc superconductivity. Applicants further note that the Rao article acknowledges that "a large variety of oxides" are prepared by the general principles of ceramic science and that applicants discovered that metal oxides are high Tc superconductors.
Citing reference 5 therein - the book "New Directions in Solid State Chemistry", Rao et al. 1989 (Cambridge; Cambridge University Press) for which there is a 1986 edition which predates applicants' filing date (See Attachment B), Rao et al. states:

Several methods of synthesis have been employed for preparing cuprates, with the objective of obtaining pure monophasic products with good superconducting characteristics [3, 4]. The most common method of synthesis of cuprate superconductors is the traditional ceramic method which has been employed for the preparation of a large variety of oxide materials [5]. Although the ceramic method has yielded many of the cuprates with satisfactory characteristics, different synthetic strategies have become necessary in order to control factors such as the cation composition, oxygen stoichiometry, cation oxidation states and carrier concentration. Specifically noteworthy amongst these methods are chemical or solution routes which permit better mixing of the constituent cations in order to reduce the diffusion distance in the solid state [5, 6]. Such methods include coprecipitation, use of precursors, the sol-gel method and the use of alkali fluxes. The combustion method or self-propagating high-temperature synthesis (SHS) has also been employed.

Reference 5 is another example of a reference to the general principles of ceramic science incorporated into applicants' teaching. The Rao et al. article states that the 29 materials reported on in the article and listed in Table 1 are fabricated using the general principles of ceramic science. Moreover, the Rao

article states that these materials are fabricated by what the Rao article calls the "ceramic method" which is the preferred embodiment in applicants' specification, yet 12 of the 29 materials in Table 1 do not come within the scope of the claims allowed by the examiner. Thus known examples fabricated according to applicants' teaching will not be literally infringed by the Rao, Duncombe and Poole examples.

The examiner disagrees with applicant's position regarding enablement of the instant application stating:

> The present specification discloses on its face that only certain copper oxide compositions of rare earth and alkaline earth metals made according to certain steps will superconduct at > 26°K. Those affidavits are not deemed to shed light on the state of the art and enablement at the time the invention was made.

It is not relevant that applicants disclosed specific compositions. There is no evidence in the record to indicate that anything more is needed to fabricate compositions which can be used to practice applicants' invention to the full scope that it is claimed in the present invention. To the contrary, applicants have shown numerous examples in the affidavits and references of samples fabricated according to applicants' teaching useful to practice their claimed

invention. Notwithstanding, since the claims are apparatus and device claims, applicants do not believe that they are required to provide a teaching of how to fabricate all compositions which may be used within the full scope of applicants' claimed invention.

The examiner further states:

> One may know now of a material that superconducts at more than 26°K. but the affidavits do not establish the existence of that knowledge on the filing date for the present application. Even if the present application "includes all known principles of ceramic fabrication", those affidavits do not establish that the level of skill in the superconducting art as of the filing date of that application would enable the skilled artisan to produce superconductive ceramic oxides other than copper oxide compositions of rare earth or Group III B element and alkaline earth metals.

There is no evidence in the record to indicate that anything more is needed to fabricate compositions which can be used to practice applicants' invention to the full scope that it is claimed in the present invention. To the contrary, applicants have shown numerous examples in the affidavits and references, of samples fabricated according to applicants' teaching useful to

practice their claimed invention. Notwithstanding, since the claims are apparatus and device claims, applicants do not believe that they are required to provide a teaching of how to fabricate all compositions which may be used within the full scope of applicants' claimed invention.

The examiner further states:

> Although applicants argue that the "standard of enablement for an apparatus or device is not the same as the standard of enablement for a composition of matter", and that their claimed invention is enabling because it is directed to an apparatus rather than a composition, the examiner respectfully maintains that the instant claims must be enabled not only for apparatus limitations, but also for the superconductive ceramic compositions at the time of filing.

Applicants discovered that metal oxides had Tc > 26°K. This was not known prior to applicants' discovery. Once this is realized, the only enablement required for applicants' claims are to cool a metal oxide below the Tc and to provides a superconducting current. It is not necessary for applicants to provide a detailed method of making every composition which can be used within the scope of their claims. Applicants' claims are not directed to the composition of matter. They are directed only to the use of the metal oxide as a superconductor

with a Tc>26°K, that is, as a circuit element in operation. It was within the skill of the art to fabricate metal oxides using the applicants teaching and test them for a Tc > 26°K using techniques well known prior to applicants filing date.

Applicants agree that apparatus or device claims are subject to the statutory provisions of 35 U.S.C. 112, first paragraph. However, those provisions are directed to the claimed apparatus or device invention and not to a composition of matter claim. It is not relevant how a composition, which can be used to practice applicants' claims, is made since the invention is how the composition is used in an apparatus or device. Thus the type of enablement is different. For example, if a circuit containing a resister is claimed, the applicant does not have to teach all known methods to fabricate the resistor and the claim will read on circuits including resistors made by methods discovered after the filing date of the application. Here applicants are claiming a high Tc superconductor (a type of resistor) that carries a current below a temperature of Tc > 26°K. This is a circuit element in operation.

The examiner further states:

> As acknowledged by applicant, no such high Tc materials (greater than 26K) were known to the skilled artisan at the time of filing, and for the skilled artisan to make such materials outside the scope of

copper oxide compositions of rare earth or Group III B element and alkaline earth metals would require experimentation beyond what is routine.

Although it was not known that the materials taught by applicants were superconducting as taught by applicants, these types of materials were known prior to applicants discovery. For example, the affidavits of Shaw and Duncombe refer to Glasso "Structures, Properties and Preparation of Perovskite-Type Compounds" which was published about 18 years before applicants' filing date. Moreover, in the specification at page 13, lines 1-10, two articles are referred to and incorporated by reference. These articles report on perovskite-like layered oxides of mixed valent transition metals and methods of preparation. They did not find or try to find superconductivity.

Applicants have extensively referred to "Copper Oxide Superconductors" by Charles P. Poole, Jr., et al., (hereinafter, "the Poole book" or "the Poole article") as supporting their position that higher temperature superconductors were not that difficult to make after their original discovery. This is because methods of making metal oxides which could be used to practice applicants' claimed invention were well known prior to applicants discovery that metal oxides had a $T_c > 26°K$. In response the examiner states "Initially, however, it should be noted that the Poole article was published after the priority date presently

claimed". It is not relevant that the Poole article was published after the priority date since it is clear evidence that only routine experimentation was needed to practice applicants' claimed invention and there is no indication that anything more than applicants' teaching is needed. The two articles referred to at page 18, lines 1-10, of the specification, the Galasso book cited in the affidavits of Duncombe and Shaw and the book by Rao "New Direction In Solid State Chemistry" were published prior to applicants filing date. The examiner further comments on the Poole book stating, "[a]s such, it does not provide evidence of the state of the art at the time the presently claimed invention was made". As noted in applicants' prior response, Poole clearly states that the materials that can be used within the scope of applicants claims were easily made. Moreover, in copending divisional application 08/303,561, paper 77E the examiner has acknowledged that the fabrication techniques were well known prior to applicants' invention. Poole states that is why so much work was done in so short a period of time. This is clear and convincing evidence that persons of skill in the art were fully enabled by applicants teaching to practice applicants' claimed invention. It is not necessary for applicants to show that the data was generated prior to applicants' filing date. The examiner has not stated, nor is there any evidence presented by the examiner, nor is there any indication in the Poole book that anything more than what applicants taught was necessary to practice applicants' claimed invention. It is only necessary that persons of skill in the art can practice applicants' claimed invention from applicants' teaching

without undue experimentation. As stated in In re Angstadt there is no requirement of no experimentation to practice the claimed invention which is the standard the examiner is apparently applying.

As noted in applicants' prior response In re Angstadt states at 190 USPQ 219:

> We note that the PTO has the burden of giving reasons, supported by the record as a whole, why the specification is not enabling. In re Armbruster, 512 F.2d 676, 185 USPQ 152 (CCPA 1975). Showing that the disclosure entails undue experimentation is part of the PTO's initial burden under Armbruster; this court has never held that evidence of the necessity for *any* experimentation, however slight, is sufficient to require the applicant to prove that the type and amount of experimentation needed is not undue.

The examiner has not commented on applicants' arguments rebutting the examiner's reasons for non-enablement. The examiner has not satisfied his burden of giving reasons, supported by the record as a whole, why the specification is not enabling. Applicants have provided extensive evidence that to practice applicants claimed invention does not require undue experimentation but only requires routine experimentation. That only routine experimentation is needed to practice applicants claimed invention is shown for example by the affidavits of Mitzi, Dinger, Tsuei, Shaw and Duncombe, the articles referred to at

page 13, lines 1-10 of the specification, the article of Rao et al. and the book of Poole et al. all of which state or show it is straight forward to use the general principles of ceramic science to make high T_c transition metal oxide superconductors which is applicants' teaching.

According to In re Angstadt 190 USPQ 214, 218 in an unpredictable art, §112 does not require disclosure of a test with every species covered by a claim. The CCPA states:

> To require such a complete disclosure would apparently necessitate a patent application or applications with "thousands" of examples or the disclosure of "thousands" of catalysts along with information as to whether each exhibits catalytic behavior resulting in the production of hydroperoxides. More importantly, such a requirement would force an inventor seeking adequate patent protection to carry out a prohibitive number of actual experiments. This would tend to discourage inventors from filing patent applications in an unpredictable area since the patent claims would have to be limited to those embodiments which are expressly disclosed. A potential infringer could readily avoid "literal" infringement of such claims by merely finding another analogous catalyst complex which could be used in "forming hydroperoxides."

This is exactly the situation in the present application. If applicants are limited to the claims that are allowed by the examiner, a potential infringer could readily avoid "literal" infringement of such claims by merely finding, through routine experimentation, other transition metal oxides having a high Tc. As shown below there are numerous materials made according to applicants' teaching which do not come within the scope of the claims allowed by the examiner in the answer. As noted herein, the Poole book, the Duncombe affidavit, the Rao article and the Hand Book of Chemistry and Physics list numerous examples of materials fabricated according to applicants' teaching which do not fall within the scope of the allowed claims but do fall within the scope of the non-allowed claims.

> What the Examiner "**<u>seems to be obsessed with is the thought of [transition metal oxides] which won't work to produce the intended result. Applicants have enabled those of skill in the art to see that this is a real possibility which is commendable frankness in a disclosure</u>**." In re Angstadt, Supra. (Emphasis Added)

The examiner has not commented on applicants citation of In re Angstadt in support of their position which has been presented as bolded and underlined above. The examiner seams to be of the view that the first paragraph of 35 USC

112 requires absolute certainty. As stated in applicants' prior response dated 8-2-99 according to In re Angstadt 190 USPQ 214, 218 in an unpredictable art, §112 does not require disclosure of a test with every species covered by a claim. In the office action the examiner has not responded nor rebutted applicants' argument.

As stated by applicants in the response dated 8-2-99 according to In re Angstadt all that is necessary is that the experimentation required to determine which combinations have the desired result (i.e. Tc greater than 26ºK) can be produced without undue experimentation and would not "require ingenuity beyond that to be expected of one of ordinary skill in the art". 190 USPQ, 214, 218 in re Field v. Connover 170 USPQ, 276, 279 (1971). Applicants have provided extensive evidence that metal oxides can be made according to applicants' teaching without undue experimentation and without requiring "ingenuity beyond that to be expected of one of ordinary skill in the art". In the office action, the examiner has not responded to nor rebutted applicants' arguments.

The examiner further states:

The "amount of guidance or direction" refers to that information in the application, as originally filed, that teaches exactly how to make

> or use the invention. The more that is known in the prior art about the nature of the invention, how to make, and how to use the invention, and the more predictable the art is, the less information needs to be explicitly stated in the specification. In contrast, if little is known in the prior art about the nature of the invention and the art is unpredictable, the specification would need more detail as to how to make and use the invention in order to be enabling. See O'Reilly v. Morse, 56 US (15 How.) 62, 111-113 (1853).

Applicants note as stated above, prior to applicants' discovery it was well known how to make metal oxides useful to practice applicants' invention. What was not known was that metal oxides where superconductors above 26°K. The MPEP SECTION---2164.01(a) entitled "Undue Experimentation Factors" citing In re Wands 8USPQ2d 1400 states:

> There are many factors to be considered when determining whether there is sufficient evidence to support a determination that a disclosure does not satisfy the enablement requirement and whether any necessary experimentation is "undue." These factors include, but are not limited to:
>
> (A) The breadth of the claims;
> (B) The nature of the invention;
> (C) The state of the prior art;

(D) The level of one of ordinary skill;
(E) The level of predictability in the art;
(F) The amount of direction provided by the inventor;
(G) The existence of working examples; and
(H) The quantity of experimentation needed to make or use the invention based on the content of the disclosure.

The examiner has not applied these factors. Applicants have shown that:

(A) Their claims are as broad as their discovery which is that metal oxides can carry a superconductive current for a Tc > 26º K;

(B) The invention is easily practiced by a person of skill in the art;

(C) The state of the prior art clearly shows how to fabricate materials which can be used to practice applicants' invention;

(D) The level of one of ordinary skill in the are is not high since as sated in the Poole et al. book materials to practice applicants invention are easily made and all that is needed to practice applicants' claimed invention is to cool the material below the Tc and to provide a current which will be a superconductive current. It has been well known how to do this since the discovery of superconductivity in 1911. (See page 1 of "Superconductivity" by M. Von Laue)

(E) There is no unpredictability in how to make materials to practice applicants' invention and there is no unpredictability in how to practice applicants' invention. The only unpredictability is which

particular metal oxide will have a Tc >26°K. As extensively shown by applicants this is a matter of routine experimentation. The examiner has not denied not rebutted this;

(F) Applicants have provided extensive direction to make materials to practice their claimed invention. They have included all known principles of ceramic science. Also, as stated in the Poole book these materials are easily made. The examiner has not denied nor rebutted this. The examiner has made no comment on the amount of direction provided by the applicants;

(G) Applicants have provided sufficient working examples and examples of metal oxides that have Tc > 26°K for a person of skill in the art to fabricate materials that can be used to practice applicants' claimed invention; and

(H) Applicants have shown that the quantity of experimentation needed to make samples to use the invention based on the content of the disclosure in the specification is routine experimentation.

The MPEP SECTION---2164.01(a) further states:

The fact that experimentation may be complex does not necessarily make it undue, if the art typically engages in such experimentation. In re Certain Limited-Charge Cell Culture Microcarriers, 221 USPQ 1165, 1174 (Int'l Trade Comm'n 1983), aff'd. sub nom., Massachusetts Institute of Technology v. A.B. Fortia, 774 F.2d 1104, 227 USPQ 428 (Fed. Cir. 1985).

> See also In re Wands, 858 F.2d at 737, 8 USPQ2d at 1404. The test of enablement is not whether any experimentation is necessary, but whether, if experimentation is necessary, it is undue. In re Angstadt, 537 F.2d 498, 504, 190 USPQ 214, 219 (CCPA 1976). MPEP 2164

There is no statement by the examiner nor any evidence in the record that the experimentation to make materials to practice applicants' claimed invention is complex or undue. But it is clear that even if the experimentation was complex to make samples to practice applicants' claimed invention it would not render applicants' claims not enabled since the art typically engages in the type of experimentation taught by applicants to make samples to practice their claimed invention.

The facts of In re Wands have similarity to the facts of the present application under appeal. The Court at 8 USPQ2d 1406 held that:

> The nature of monoclonal antibody technology is that it involves screening hybridomas to determine which ones secrete antibody with desired characteristics. Practitioners of this art are prepared to screen negative hybridomas in order to find one that makes the desired antibody.

Correspondingly applicants have shown that the nature of high Tc technology is that it involves preparing samples to determine which ones have

Tc > 26°K - the desired characteristic. Practitioners of this art are prepared to prepare samples in order to find one that have the desired Tc. Nothing more is required under In re Wands.

Applicants have shown that their specification is enabling with respect to the claims at issue and that there is considerable direction and guidance in the specification; with respect to applicants' claimed invention there was a high level of skill in the art to fabricate samples at the time the application was filed; and all of the methods needed to practice the invention were well known. Thus applicants have shown that after considering all the factors related to the enablement issue, it would not require undue experimentation to obtain the materials needed to practice the claimed invention. The examiner has not denied nor rebutted this.

A conclusion of lack of enablement means that, based on the evidence regarding each of the above factors, the specification, at the time the application was filed, would not have taught one skilled in the art how to make and/or use the full scope of the claimed invention without undue experimentation. In re Wright, 999 F.2d 1557,1562, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993). It is the examiner's burden to show this and the examiner has clearly not done so.

The breadth of the claims was a factor considered in Amgen v. Chugai Pharmaceutical Co., 927 F.2d 1200, 18 USPQ2d 1016 (Fed. Cir.), cert. denied, 502 U.S. 856 (1991). In the Amgen case, the patent claims were directed to a purified DNA sequence encoding polypeptides which are analogs of erythropoietin (EPO). The Court stated that:

> Amgen has not enabled preparation of DNA sequences sufficient to support its all-encompassing claims. . . . [D]espite extensive statements in the specification concerning all the analogs of the EPO gene that can be made, there is little enabling disclosure of particular analogs and how to make them. Details for preparing only a few EPO analog genes are disclosed. . . . This disclosure might well justify a generic claim encompassing these and similar analogs, but it represents inadequate support for Amgen's desire to claim all EPO gene analogs. There may be many other genetic sequences that code for EPO-type products. Amgen has told how to make and use only a few of them and is therefore not entitled to claim all of them. 927 F.2d at 1213-14, 18 USPQ2d at 1027.

In the present application applicants have provided a teaching (and proof thereof) of how to make all known high Tc materials useful to practice their claimed invention. As the Amgen court states this type of disclosure justifies a generic claim. As the In re Angstadt court states the disclosure does not have to provide examples of all species within applicants claims where it is within the skill of the art to make them. There is no evidence to the contrary.

Even though applicants' claims do not cover inoperable species, In re Angstadt clearly permits a claim to include inoperable species where to determine which species works does not require undue experimentation. The examiner has not presented any substantial evidence that undue experimentation is required to practice applicants' claim. This is the examiner's burden. On the other hand, applicants have presented five affidavits of experts, the book of Poole and the article of Rao all of which agree that once a person of skill in the art knows of applicants' invention, it is straight forward to fabricate other sample. Also, in response to the examiner's inquiry, "if the applicants could not show superconductivity with a $T_c > 26°K$ for certain compositions falling within the scope of the present claims, it is unclear how someone else skilled in the art would have been enabled to do so at the time the invention was made", it is clear that a person of skill in the art would have been enabled by routine experimentation following applicants teaching to determine other samples with $T_c > 26°K$. This is all that is required, and there is no evidence in the record to the contrary.

In the prosecution, applicants have noted that the examiner has taken a contrary view to applicants' five affiants each of whom has qualified himself as an expert in the field of ceramic technology and in superconductivity. Also, the examiners' argument for nonenablement is primarily based on the examiner

"deeming" the rejected claims nonenabled based in the unsupported assertion that the art of high Tc is unpredictable and not theoretically understood, that is, the examiner's opinion or belief that the claims are not enabled. In the prosecution, applicants requested the examiner to submit an affidavit to qualify himself as an expert to conslusorily **"deem"** the rejected claims nonenabled and to substantiate the unsupported assertions. The examiner has not submitted an affidavit. 37 CFR 104(d)(2) states "[w]hen a rejection in an application is based on facts within the personal knowledge of an employee of the office ... the reference <u>must</u> be supported when called for by the applicants, by an affidavit of such employee." (Emphasis Added)

The examiner incorrectly states "The 'amount of guidance or direction' refers to that information in the application, as originally filed, that teaches exactly how to make or use the invention." The application only has to provide enough guidance and direction for a person of skill in the art to practice the claimed invention. Applicants do not have to include what is know to a person of skill in the art at the time the application was filed. Applicants have provided extensive evidence that persons of skill in that art at the time the application was filed knew how to make metal oxides useful to practice applicants' claimed invention. There is no evidence to the contrary in the record. There is no evidence in the record that the art of high Tc superconductivity is sufficiently unpredictable that a person of skill in the art cannot practice applicants' claimed

invention with applicants' teaching and what is known in the art. The only thing which was not known is that metal oxides have a Tc greater than 26 K - this is applicants' s discovery. How to make these materials was well known prior to applicants' discovery. This art is not so unpredictable that more than applicants' teaching is needed to practice applicants' claimed invention.

Claims 1, 17, 19, 20-23, 27-31, 33, 36-38, 40-45, 55, 56, 58, 59, 64, 72, 77-81, 86, 93-96, 103, 111, 137, 144-145, 149-152, 156-161, 163, 165-168, 170-171, 173, 175-183, 187, 189, 199-201, 205-210, 212-216 and 224 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In view of the changes to the claims and the remarks herein withdrawal of this rejection is respectfully requested.

The examiner states as to "claim 1, lines 2 and 3., it is unclear with the term "rare earth-like element" In applicants' response dated 8-2-99, in particular for example at page 100, applicants show by substantial evidence that it is patent office practice to issue claims having terminology which is a combination of "-like" and "-type". Applicants explain the meaning of “rare-earth-like” at page 7, lines 8-25, “[a] rare earth-like element (sometimes termed a near rare earth element) is one whose properties make it essentially a rare earth element ...”. Thus applicants disagree with the examiner that the terms "type" and "like" are

unclear. In addition in the amendments incorporated by reference below from copending divisional application 08/303,561 filed on 09/09/94, which cite numerous non patent literature from prior to the earliest filing date of the present application.

Applicants disagree that "Claim 17 is unclear with the term "rare earth-like element" for the reasons given above.

The examiner states "Claim 19 is unclear with the term 'perovskite-like superconducting phase'". Applicants respectfully disagree. Applicant's published their publication in Z. Phys. B - Condensed Matter 64 (1986) 189-193 (Sept. 1986) which is incorporated by reference in the present specification at page 6, lines 7-10. (This article is referred to here in as a applicants' article.) Applicants filed the first application in the lineage for the present application on May 22, 1987. To the extent that the terminology "perovskite-type", "perovskite-like", etc. were not know prior to applicants discovery, it was placed into the vernacular of persons of skill in the art in the approximately eight months between the publication of applicants' article the earliest filing date of the present application. Applicants' article was published in a highly regarded physics journal. The referees for the article apparently understood what applicants meant by this terminology. The applicants were awarded a Nobel Prize based on this article. The Nobel committee apparently understood what applicants were referring to.

Applicants' article at page 189, fourth line of the abstract, refers to "a perovskite-like mixed-valent copper compound"; at page 189, lines 14-15 of the right column, refers to "perovskite-type or related metallic oxides"; at page 192, line 12 of the left column, refers to "layer-like phases"; and the 8th line of the conclusion at page 192 refers to "a metallic perovskite-type layer-like structure". As stated in the brief at pages 106-107 the book by Poole uses this terminology attributing it to applicants article. Chapter VI, Section D, of the Poole Book is entitled "Pervoskite-type Superconducting Structures" pp. 78-81. It is thus clear that the objected to terminology is understood by persons of skill in the art as of the earliest filing date of the present application. Moreover, as shown in the prior response 102 issued United States Patents uses the terminology "pervoskite like", two of which use this term in the claims. It is thus accepted USPTO practice to accept this term as definite. Also, as shown in the brief there are many issued patents using combinations of "-type" and "-like" with claims. Thus it is accepted USPTO practice to accept such terminology as definite.

Moreover, in applicants' response dated 8-2-99, applicants extensively discuss the terminology of the present application which incorporates by reference applicants' article.

Moreover, the affidavits of Duncombe and Shaw refer to a number of articles and texts on the general principles of ceramic science. One of these

texts is "Structures, Properties and Preparation of Peroskite-type Compounds", F. S. Galasso (1969). This book was published about eighteen years before applicants' filing date. A copy of the complete text of this book was provided with the affidavits. The examiner does not comment on why a person of skill in the art would not know what a perovskite-type compound was in view of this book and the teaching of applicants' article.

The examiner further states:

> Claims 20-23 are unclear with the term "substituted transition metal oxide". That terminology is unclear as to what is the substitute for Cu-oxide and as to how much substitution occurs.

This is a commonly used term in the art. This term is used throughout applicants specification, in particular, for example, in the sentence bridging pages 11 and 12 of applicants specification states " [i]n these compounds the RE portion can be partially substituted by one or more members of the alkaline earth group of elements." Applicants specification further teaches at page 12, lines 5 to page 12 line 1:

> " For example, one such compound that meets this general description is lanthanum copper oxide La_2CuO_4 in which the

lanthanum - which belongs to the III B group of elements - is in part substituted by one member of tile neighboring IIA group of elements, viz. by one of the alkaline earth metals (or by a combination of the members of the IIA group), e.g., by barium. Also, the oxygen content of the compound can be incomplete such that the compound will have the general composition $La_{2-x}Ba_xCuO_{4-y}$, wherein $x < 0.3$ and $y < 0.5$.

Another example of a compound meeting this general formula is lanthanum nickel oxide wherein the lanthanum is partially substituted by strontium, yielding the general formula La 2-x SrxNiO 4-y' Still another example is cerium nickel oxide wherein the cerium is partially substituted by calcium, resulting in Ce_{2-x} $Ca_xNiO_{4-y'}$.

The following description will mainly refer to barium as a partial replacement for lanthanum in a La CuO as a partial replacement for lanthanum in a La_2CuO_4 compound because it is in the Ba-La-Cu-O system that many laboratory tests have been conducted."

Moreover the book "Copper Oxide Superconductors" by Poole et al., cited above, has at page 122 a section entitled "Substitutions" (See Attachment G of applicants' response dated 11-28-97) which states "[a]n important question that arises concerns which of the constituent atoms are essential and which can be replaced by related or perhaps not so related atoms" Sections 1 and 2 deal with rare earth substitutions; Section 3 with alkaline earth substitutions; Section 4 with paramagnetic substitutions; Section 5 with nonmagnetic substitutions; and, Section 6 with substitutions for oxygen. Thus "substituted transition metal oxide" has been extensively described by applicants and is well understood in the art.

The examiner further states:

> Claim 27 has the terminology "substituted Cu-oxide" but that terminology is unclear as to what is the substitute for Cu-oxide and as to how much substitution occurs.

This is clear for the same reason as given above.

The examiner further states:

> Claim 27 has the language "said composition being a substituted Cu-oxide including a superconducting phase having

a structure substantially close to the orthorhombic-tetragonal phase transition of said composition". That language is found to be indefinite because it is unclear how close is "substantially close". Relative terminology in a claim is indefinite when one of ordinary skill in the art would not be apprised of the scope of the claim. In this case, one skilled in the art would not be able to determine whether the superconducting phase is physically close to the orthorhombic-tetragonal phase transition or whether that phase is "like" that transition.

Applicants respectfully disagree. The language "orthorhombic-tetragonal phase transition" is generally used in the art and in particular is used by applicants in the sentence bridging pages 25 and 26 which states "[t]he highest Tc for each of the dopant ions investigated occurred for those concentrations where, at room temperature, the $RE_{2-x}TM_xO_{4-y}$ structure is close to the orthorhombic-tetragonal structural phase transition, which may be related to the substantial electron-phonon interaction enhanced by the substitution." Claim 27 has been amended to recite "structurally substantially similar" by which applicants "substantially close".

The Poole et al. book in Chapter VI on "Crystallographic Structures" state states page 73 "[m]uch has been said about the oxide superconductor

compounds being ***perovskite types*** **,** so we will begin with a description of the perovskite structure." (emphasis added) Poole further states at page 74 in Section 4 entitled "Tetragonal Form" that "[a]t room temperature barium titanate is tetragonal ... which is close to cubic." Poole further states at page 74 in Section 3 entitled "Orthorhombic Form" that "[w]hen barium titanate is cooled below 5°C it undergoes a transition with a further lowering of the symmetry to the orthorhombic space group." It is thus clear that the orthorhombic-tetragonal structural phase transition is understood by a person of skill in the art. (See Attachment I of applicants response dated Nov. 28, 1997.)

The examiner further states claim 28 is unclear with the language "rare earth-like". Applicants respectfully disagree for the reasons given above.

The examiner further states "Claim 29 is unclear with the language 'substituted Cu oxide'." Applicants respectfully disagree for the reasons given above.

The examiner further states:

> Claim 30 is indefinite with the limitation that "said alkaline earth element is atomically large with respect to Cu". That limitation is unclear as to how the alkaline earth element is "large", i.e.,

whether size is measured according to covalent radius, metallic radius, or atomic volume. The term "large" also is unclear as to how large is "large".

Applicants respectfully disagree. The language clearly means that the alkaline earth is larger than the Cu. Any one of the measurements of size listed by the examiner would be means to make such a determination. This terminology is understood by a person of skill in the art. At page 78 of the book by Poole et al. there is a section entitled "Atomic Sizes". Pages 79-80 of Poole et al. has a table of ionic radii of selected elements. At page 78 Poole et al. states "Table VI-2 gives the ionic radii of the positively charged ions of various elements of the periodic table. These radii are useful for estimating changes in lattice constant when ionic substitutions are made in existing structures". (See Attachment I of applicants' response dated Nov. 28, 1997). It is clear therefore, that atomically large means that the alkaline earth is larger than Cu. Copper has two ionic forms each with a different radius. The alkaline earths also have several ionic form and different radii.

The examiner further states:

Claim 33 is unclear as to whether the alkaline earth element is concentrated "near" to the copper oxide concentration or

> whether the degree of alkaline earth element concentration is near" to the amount of copper oxide concentration. If the latter is the case, then it is unclear if the degree of concentration is in molar or weight percentages.

Applicants respectfully submit that the claim is clearly worded. The claim recites "the composition being comprised of a copper oxide doped with an alkaline earth element where the concentration of said alkaline earth element is near to the concentration of said alkaline earth element where the superconducting copper oxide phase in said composition undergoes an orthorhombic to tetragonal structural phase transition." That is the claim recites copper oxide doped with alkaline earth - the concentration of the alkaline earth has a value near to that concentration which results in an orthorhombic to tetragonal phase transition. This is what the language of the claim says. Since it is within the skill of the art using routine experimentation to determine how much alkaline earth is need to be near to the phase transition, it is not necessary fo r the claim to recite a specific value.

The examiner further states:

> Claim 33 is unclear as to the "superconducting copper oxide phase" changes into the tetragonal structural phase or whether

that "superconducting copper oxide phase" is found in a composition at the boundary between orthorhombic and tetragonal phases.

Applicant submit that the language of the claim is clear. Applicants do not understand the Examiners comments. There is no boundary referred to in applicants claim. The Poole et al. book in Chapter 6 entitled "Crystallographic Structures" in Section B thereof entitled "Peovskites" describes various crystal structures: cubic form, tetragonal form, orthorhombic form, alternate tetragonal form . In subsection 4 on page 85 entitled Phase Transitions states "[t]he compounds $(La_{1-x} M_x)CuO_4$ with M=Sr and Br are orthorhombic at low temperatures and low M content, and tetragonal otherwise." (See Attachment I of applicants' response dated Nov. 28, 1997) Sr and Br are alkaline earth elements. (See the definition of alkaline-earth metals from Hawley's Condensed Chemical Dictionary p 36 in Attachment J of applicants' response dated Nov. 28, 1997).

The examiner further states "Claim 36 is unclear with the language 'substituted copper oxide'." Applicants respectfully disagree for the reasons given above.

The examiner further states:

> Claim 40 is unclear with the language "said superconductor being comprised of at least four elements, none of which is itself superconducting". Included with this Office Action are pp. E-84 and E-85 of the Handbook of Chemistry and Physics (8283), which show that rare earth and III B metals (La, Ce, Lug) will superconduct, as well as a IIA metal (BA).

Claim 40 has been amended in applicants' response of Nov. 28, 1997 to recite "none of which is itself superconducting <u>at a temperature in excess of 26°K</u>. "

The examiner further states:

> Claim 42 is unclear because the term "doped transition metal oxide" does not indicate what the dopant is.

Applicants respectfully submit that "doped transition metal oxide" is used generically since applicants teaching is generic, specific examples of which are given in applicants specification". See applicants' specification:

page	line
15	6-7
21	14
25	9, 19
27	13-23

The examiner further states:

> Claim 43 is indefinite with the requirement that the "doped transition metal oxide is multivalent"'. A metallic element may be "multivalent-" but it is unclear how an oxide may be "multivalent" as well.

This is a term used and well understood in the art. Applicants' specification at page 7, line 5, teaches multivalent metal oxides." Attachment K of applicants' response dated Nov. 28, 1997 is a Lexis search performed by the undersigned attorney printed out using KWIC feature showing 68 issued US patents using the terminology "mixed valent metal oxide". This shows that this term is understood by a person of skill in the art and thus definite.

The examiner further states:

Claim 55 is indefinite with the language "'said transition metal being non-superconducting ... and said oxide having multivalent states". Presumably the transition metal is superconducting when in the appropriate oxide form. Also, the oxide itself does not have "multivalent states". while the metallic elements may.

Claim 55 has been amended in applicants' response dated Nov. 28, 1997 to recite "said transition metal oxide being non-superconducting at said superconducting onset temperature". The terminology "oxide having multivalent states" is as indicated above understood in the art and thus definite.

The examiner further states:

Claim 58 is unclear with the term "layer-like structure".

The Poole et al. book states at page 20 "[a] great deal has been said about the layering characteristics of the newer oxide materials. Layered-type superconductors with transitions temperatures in the reasonably high range from 4 to 7 K have been known for some time. " From this it is clear that the term

"layered-type" or "layer-like" are understood to a person of skill in the art". (See Attachment of applicants' response dated Nov. 28, 1997.)

The examiner further states:

Claim 59 is unclear with the term "ceramic-like".

This is a term commonly used in the art. Attachment M of applicants' response dated Nov. 28, 1997 is the results of a Lexis search performed by the undersigned attorney using the search criteria "ceramic" within one word of "like" and "copper" within one word of "oxide" and " rare" within one word of "earth". This search identified 23 issued US patents. These patents are listed in the attachment using the Lexis KWICK feature which list only those portion s of the patents where these terms appear. The search was limited to this criteria since a search on "ceramic" within one word of "like" identified more than 1,000 issued US patents and a search on "ceramic" within one word of "like" in the same document as "copper" within one word of "oxide" identified more than 1000 US patents. It is clear that the term "ceramic like" is well understood in the art and is thus definite.

The Examiner further states "Claim 64 is indefinite. i. The term "mixed copper oxide" is unclear as to whether metals other than copper must be present." Attachment N of applicants' response dated November 28, 1997 is the

results of a Lexis search performed by the undersigned attorney using the search criteria "Mixed w/1 copper w/1 oxide" and "supercond!" in the same patent. (w/1 means within one word). This search identified 13 issued US patents. These patents are listed in the attachment using the Lexis KWICK feature which list only those portions of the patents where these terms appear. Moreover, Attachment O of applicants' response dated November 28, 1997 is the same type search and listing limited to finding the terms "mixed w/1 copper w/1 oxide" in the claims and the term "supercond!" any where in the patent. The search identified 2 patents. It is thus clear that the "term mixed copper oxide" is a term well understood in the art and by a person of skill in the art and recognized by the USPTO as definite term for use in a claim.

The Examiner further states "Claim 64 is indefinite. ii. The term 'element' is unclear as to whether it involves an element other than copper and oxide." The term "element " is clear, it is a "chemical element".

The Examiner further states "Claim 64 is indefinite. iii. The language 'distorted octahedral oxygen environment' is unclear as to what the 'environment' is or how it is related to the composition." In Attachment P of applicants' response dated November 28, 1997 there is a copy of pages 75-76 of the book by Poole et al. which states in Section 4 entitled "Atomic Arrangements" "The ionic radius of Ba^{2+} and O^{2-} (1.32 A) are almost the same,

and together they form a face-centered cubic (fcc) close-packed lattice with the smaller Ti^{4+} ions (0.68 A) located in octahedral holes. The octahedral holes of a close-packed oxygen lattice have a radius of 0.545 A, and if these holes were empty the lattice parameter would be a=3.73, as shown on Fig. VI-4a. If each titanium were to move the surrounding oxygens apart to its ionic radius when occupying the hole, as shown on Fig. VI-4b, the lattice parameter a would be 4.00 A. The observed cubic (a=4.012 A) and the tetragonal (a=3.995A, c=4.034 A) lattice parameters are close to these values, indicating a **pushing** apart of the oxygens. The **tetragonal distortions illustrated** on Fig. VI-2 and the orthorhombic distortion of Eq. (VI-3) constitute attempts to achieve this through an enlarged but distorted octahedral site. **This same mechanism is operative in the oxide superconductors.** (Emphasis added). Thus the language "'distorted octahedral oxygen environment" is a term used in the art, well understood by a person of skill in the art and thus definite. Attachment N is the results of a Lexis search performed by the undersigned attorney using the search criteria "Mixed w/1 copper w/1 oxide" and "supercond!" in the same patent. (w/1 means within one word). This search identified 13 issued US patents. These patents are listed in the attachment using the Lexis KWICK feature which list only those portions of the patents where these terms appear. Moreover, Attachment O of applicants' response dated November 28, 1997 is the same type search and listing limited to finding the terms "mixed w/1 copper w/1 oxide" in the claims and the term "supercond!" any where in the patent. The

search identified 2 patents. It is thus clear that the "term mixed copper oxide" is a term well understood in the art and by a person of skill in the art and recognized by the USPTO as definite term for use in a claim.

As to Claim 72 applicants disagree that the term "rare earth-like element" is unclear for the reasons given above.

The examiner further states " Claim 77 is unclear with the terms "rare earth-like element" and "layer-like crystalline structure". These terms are clear for the reasons given above.

As to Claim 80 applicants disagree that the term "perovskite-like" is unclear for the reasons given above.

As to Claim 86 applicants disagree that the term "rare earth-like" element is unclear for the reasons given above.

The examiner states:

> Claim 93 is indefinite. That claim is unclear with the term " mixed copper oxide" because it does not indicate with what the copper oxide is "mixed".

Applicants disagree. As noted above this term is a term well known in the art and understood by a person of skill in the art and thus not indefinite.

For the reasons given above applicants disagree with the examiner that "Claim 94 is unclear with the term 'layer-like'."

The Examiner further states " Claim 95 is unclear with the requirement that 'said copper oxide material exhibits a mixed valence state'. The copper element, not the oxide material, exhibits that 'mixed valence state'." As described above this is a term well know in the art and is understood by a person of skill in the art and therefore, is clear.

The examiner further states:

> Claim 96 has the language "the superconductive composition consisting essentially of a copper-oxide compound having a layertype perovskite-like crystal structure"'.
>
> IV. The terms "type" and "like" are unclear.
>
> V. That language also is unclear as to whether other elements must be present as well.

As described above the terms "copper-oxide compound having a layer-type perovskite-like crystal structure" are well known in the art, are understood by a person of skill in the art and are thus clear. The terminology "consisting essentially of" has been changed to "comprising".

The Examiner further states " Claim 103 is unclear with the terms 'layer-type' 'perovskite-type', and 'rare-earth-like'." As note above these terms are well known in the art and understood by a person of skill in the art and are therefore, clear.

The examiner states "Claim 111, last line, is unclear with the term "superconduting". This has been corrected.

In claim 137, the language "comprising forming a composition including..." has been corrected.

In claim 144, the terminology "rare earth-like" is not indefinite for the reasons given above.

In claim 149, the terminology "layer-type perovskite-like" is not indefinite for the reasons given above.

In claim 156, the terminology "rare earth-like" and "layertype perovskite-like" is not indefinite for the reasons given above.

In claim 163, the language "comprising the steps of" has been corrected.

In claim 165, the terminology "layer-type perovskite-like" is not indefinite for the reasons given above.

In claim 166, the terminology "layer-type perovskite-like" is not indefinite for the reasons given above.

In claim 170, the terminology "layer-type perovskite-like" is not indefinite for the reasons given above.

In claim 171, the terminology "layer-type perovskite-like" is not indefinite for the reasons given above

In claim 175, the terminology "layer-type perovskite-like" is not indefinite for the reasons given above.

In claim 176, the terminology "layer-typeperovskite-like" is not indefinite for the reasons given above.

In claim 180, the terminology "layer-type perovskite-like" is not indefinite for the reasons given above.

In claim 181, the terminology "layer-type perovskite-like" is not indefinite for the reasons given above.

In claim 182, 183 and 187, the terminology "An apparatus comprising providing" or "An apparatus comprising flowing" has been corrected.

In each of claims 167, 168, 173, 175, 177-181, 199-201, 205, 210 and 213-216 comments the Markush language has been modified to address the examiner's.

The examiner further states:

> Applicants' arguments filed August 5, 1999, May 14, 1998, May 1, 1998, and December 2, 1997, paper nos. 25, 19, 18.5, and 16, as well as the Affidavits filed May 14, 1998, paper no. 18, and the Attachments, have been fully considered but not found to be persuasive.

The applicants argue that the terms "rare-earth like", perovskite-like", and "perovskite-type" are definite. Those arguments are not found to be persuasive.

> The applicants point to Attachments A-D, L, and M with LEXISTM searches which supposedly show that the terms "rare-earth like", "perovskite-like", "perovskite-type", "layer-like", and "ceramic-like" found in various US patents. That evidence is not considered to be persuasive. Each patent application is considered on its own merits. In some contexts it may have been clear in the art to use the term "like", such as when the "like" term is sufficiently defined. In the present case, however, the terms "rare-earth like" and "perovskite-like" are unclear.

The examiner gives no reason why here there terminology using "type" and "like" are unclear when applicants have clearly shown that these terms are used and understood by persons of skill in the art. Also, applicants have shown that it is standard patent office practice to issue claims having terms which are combinations of "type" and "like".

The examiner further states:

> The applicants further point to Attachments E and F, but those attachments are not considered to be persuasive. Both were published after the priority date afforded to the presently claimed invention and therefore does not reflect on the knowledge of one skilled in the art at the time the invention was made. Those articles also apparently do not reflect on the degree of precision required for patent claims. The crystalline structure itself should be identified as -- perovskite --.

In applicants' prior response, applicants referred to several attachments E and F from different previously submitted responses. The examiner has not identified which attachments E and F are being referred to by the examiner.

Applicants believe that the examiner is referring to the reference to Attachments E and F referred to at page 97 of applicants response dated 8-2-99 where applicants state:

> Attachment E of Applicants' response dated November 28, 1997 of co-pending application 08/303,561 which is incorporated herein by reference is a copy of the first page of Chapter 2 of the book

"Perovskites and High Tc Superconductors" by F. S. Galasso, Gordon and Breach Scientific Publishers, 1990. Chapter 2 is entitled "Structure of Perovskite-type Compounds". Attachment F of Applicants' response dated November 28, 1997 of co-pending application 08/303,561 which is incorporated herein by reference is a copy of page 78 of the book by C. Poole, Jr. et al. Page 78 is the beginning of the section entitled "D. Perovskite-type Superconducting Structures". The first paragraph of the section states "[i]n their first report on high-temperature superconductors Bednorz and Muller (the applicants) referred to their samples as 'metallic, oxygen deficient ... perovskite like mixed valent copper compounds.' Subsequent work has confirmed that the new superconductors do indeed have these characteristics. In this section we will comment on their perovskite-like aspects" (insert added).

Not withstanding that these Attachments E and F were published after applicants' filing data, the examiner points to nothing in either of these attachments to support his statement that the "therefore [do] not reflect on the knowledge of one skilled in the art at the time the invention was made." The facts are to the contrary. It is not relevant that Attachments E and F were published after applicants' filing data when it is clear from them that the terms

were understood by persons of skill in the art at the time of th e filing of the application.

Applicant's published their publication in Z. Phys. B - Condensed Matter 64 (1986) 189-193 (Sept. 1986) which is incorporated by reference in the present specification at page 6, lines 7-10. (This article is referred to here in as a applicants' article.) Applicants filed the first application in the lineage fo r the present application on May 22, 1987. To the extent that the terminology "perovskite-tpye", "perovskite-like", etc. were not know prior to applicants discovery, it was placed into the vernacular of persons of skill in the art in the approximately eight months between the publication of applicant s' article the earliest filing date of the present application. Applicants' article was published in a highly regarded physics journal. The referees for the article apparently understood what applicants meant by this terminology. The applicants were awarded a Nobel Prize based on this article. The Nobel committee apparently understood what applicants were referring to. Applicants' article at page 189, fourth line of the abstract, refers to “a perovskite-like mixed-valent copper compound”; at page 189, lines 14-15 of the right column, refers to “perovskite-type or related metallic oxides”; at page 192, line 12 of the left column, refers to “layer-like phases”; and the 8th line of the conclusion at page 192 refers to “a metallic perovskite-type layer-like structure”.

Moreover, the affidavits of Duncombe and Shaw refer to a number of articles and texts on the general principles of ceramic science. One of these texts is "Structures, Properties and Preparation of Peroskite-type Compounds", F. S. Galasso (1969). This book was published about eighteen years before applicants' filing date. A copy of the complete text of this book was provided with the affidavits. The examiner does not comment on why a person of skill in the art would not know what a perovskite-type compound was in view of this book and the teaching of applicants' article.

The examiner further states:

> The applicants argue that limitations directed to "substituted", "doped", or "mixed" copper or metal oxides are definite. In support of that argument, the applicants mention Attachments G, K, and 0, but those attachments appear to have been published after the priority date afforded to the presently claimed invention and therefore does not reflect on the knowledge of one skilled in the art at the time the invention was made. Regardless of what else is found in the Poole et al. source, moreover, the question still remains: Substituted with what and with how much?

At page 16 of applicants response data 8-2-99 applicants state :

> Attachment K of Applicants' response in co-pending application serial number 08/303,561 dated December 27, 1998, page 1, is a copy of the front cover of Zeitschrift Fur Physik B Condensed Matter Vol. 64 which contains Applicants' article (pp 189-193) which is referred to and incorporated by reference at page 6, lines 6-10, of Applicant's specification.

and at page 99 applicants state:

> Attachment G of Applicants' response dated December 27, 1997 of co-pending divisional application 08/303,561 which is incorporated herein by reference, shows that there are 31 issued US patents having the term "carbon like" in the claims.

There is no attachment O in applicants response dated 8-2-99.
In applicants response dated 11-27-97 at page 22 applicants state:

Attachment N is the results of a Lexis search performed by the undersigned attorney using the search criteria "Mixed w/1 copper w/1 oxide" and "supercond!" in the same patent. (w/1 means within one word). This search identified 13 issued US patents. These patents are listed in the attachment using the Lexis KWICK feature which list only those portions of the patents where these terms appear. Moreover, Attachment O is the same type search and listing limited to finding the terms "mixed w/1 copper w/1 oxide" in the claims and the term "supercond!" any where in the patent. The search identified 2 patents. It is thus clear that the "term mixed copper oxide" is a term well understood in the art and by a person of skill in the art and recognized by the USPTO as definite term for use in a claim.

It is clear that the terminology "mixed-copper-oxide" is well know in the art prior to the date of applicants invention. In addition to the substantial evidenc e presented by applicants already to support this position applicants provide Attachment D herein. Attachment D is Section 6.7 (ps 342-351) of "New Directions In Solid State Chemistry" C. Rao et al., Cambridge University Press (1986) which is entitled "Mixed-valence compounds"

Applicants respectfully disagree that the term "substituted and doped are indefinite". For example the specification refers to: La_2CuO_{4-y} doped with Sn^{2x}, Ca^{2x} and Ba^{2x} at page 25, lines 6-18 and La_2CuO_{4-y} with Sn^{2x} substitution at page 13, line 17. In the priority document, for example in the abstract, RE is a rare earth element, TM is a transition metal and O is oxygen. The priority document further states at Col. 2, lines 22-25 "the lanthanum which belongs to the II B group of elements is in part substituted by one member of the neighboring IIA group of elements...". Group IIA elements are the alkaline earth elements.

Similar language appears in the present specification at page 12 lines 6-8, "the lanthanum which belongs to the II B group of elements is in part substituted by one member of the neighboring IIA group of elements...".

It is noted that at column 2, lines 13-19 the priority document states that "it is a characteristic of the present invention that in the compounds in question that the RE portion is partially substituted by one member of the alkaline earth group of metals, or by a combination of the members of this alkaline earth group and that the oxygen content is at a deficit." It is further noted that at column 2, lines 20-23 it states that "for example, one such compound that meets the description given by this lanthanum copper oxide La_2CuO_4 in which the lanthanum which belongs to the III B group of the elements is in part substituted by one member of the neighboring III A group of elements."

The priority document further states at Col. 2, lines 22-25 "the lanthanum which belongs to the II B group of elements is in part substituted by one member of the neighboring IIA group of elements...".

It is noted that in the priority document, claim 2 refers to lanthanum as the rare earth; claim 3 refers to cerium as the rare earth; claim 5 refers to barium as a partial substitute for the rare earth; claim 6 refers to calcium as a partial substitute for the rare earth; claim 7 refers to strontium as a partial substitute for the rare earth and claim 9 refers to neodymium as the rare earth.

Similar language appears in the present specification at page 12 lines 6-8, "the lanthanum which belongs to the II B group of elements is in part substituted by one member of the neighboring IIA group of elements...".

It is further noted that at column 2, lines 20-23 it states that "for example, one such compound that meets the description given by this lanthanum copper oxide La_2CuO_4 in which the lanthanum which belongs to the III B group of the elements is in part substituted by one member of the neighboring III A group of elements."

It is noted that in the priority document, claim 2 refers to lanthanum as the rare earth; claim 3 refers to cerium as the rare earth; claim 5 refers to barium as a partial substitute for the rare earth; claim 6 refers to calcium as a partial substitute for the rare earth; claim 7 refers to strontium as a partial substitute for the rare earth and claim 9 refers to neodymium as the rare earth. Clearly, the priority document uses barium, calcium and strontium.

The Examiner further states that "Claims 20-23 are unclear with the term 'substituted transition metal oxide'. That terminology is unclear as to what is the substitute for Cu-oxide and as to how much substitution occurs." This is a commonly used term in the art. This term is used throughout applicants specification, in particular, for example, in the sentence bridging pages 11 and 12 of applicants specification states " [i]n these compounds the RE portion can be partially substituted by one or more members of the alkaline earth group of elements." Applicants specification further teaches at page 12, lines 5 to page 12 line 1:

Applicants specification further teaches at page 12, lines 5 to page 12 line 1:

" For example, one such compound that meets this general description is lanthanum copper oxide La_2CuO_4 in which the lanthanum - which belongs to the III B group of elements - is in part

substituted by one member of tile neighboring IIA group of elements, viz. by one of the alkaline earth metals (or by a combination of the members of the IIA group), e.g., by barium. Also, the oxygen content of the compound can be incomplete such that the compound will have the general composition La 2-x Ba_xCuO_{4-y}, wherein $x < 0.3$ and $y < 0.5$.

Another example of a compound meeting this general formula is lanthanum nickel oxide wherein the lanthanum is partially substituted by strontium, yielding the general formula $La_{2-x}Sr_xNiO_{4-y'}$ Still another example is cerium nickel oxide wherein the cerium is partially substituted by calcium, resulting in $Ce_{2-x}Ca_xNiO_{4-y'}$.

The following description will mainly refer to barium as a partial replacement for lanthanum in a La CuO as a partial replacement for lanthanum in a La2Clio4 compound because it is in the Ba-La-Cu-0 system that many laboratory tests have been conducted."

Moreover the book "Copper Oxide Superconductors" by Poole et al., cited above, has at page 122 a section entitled "Substitutions" (See Attachment G of Applicants response dated November 28, 1997) which states "[a]n

important question that arises concerns which of the constituent atoms are essential and which can be replaced by related or perhaps not so related atoms" Sections 1 and 2 deal with rare earth substitutions; Section 3 with alkaline earth substitutions; Section 4 with paramagnetic substitutions; Section 5 with nonmagnetic substitutions; and, Section 6 with substitutions for oxygen. Thus "substituted transition metal oxide" has been extensively described by applicants and is well understood in the art.

Applicants respectfully submit that the claims are clearly worded and are definite. The claim recites "the composition being comprised of a copper oxide doped with an alkaline earth element where the concentration of said alkaline earth element is near to the concentration of said alkaline earth element where the superconducting copper oxide phase in said composition undergoes an orthorhombic to tetragonal structural phase transition." That is the claim recites copper oxide doped with alkaline earth - the concentration of the alkaline earth has a value near to that concentration which results in an orthorhombic to tetragonal phase transition. This is what the language of the claim says. Since it is within the skill of the art using routine experimentation to determine how much alkaline earth is need to be near to the phase transition, it is not necessary for the claim to recite a specific value.

The examiner further states:

> The applicants assert that the other terminology discussed above is definite, but those assertions are not found to be persuasive for the reasons that follow. It is suggested that the claims be rewritten to comport with the basic rules of standard patent practice.

Applicants maintain, as demonstrated by the extensive evidence submitted, that the terminology is definite since it is the language of the art and persons of skill in the art know what this terminology means. Thus they are acceptable terms for patent practice.

The examiner further states with out identifying a claim:

> The language "said composition being a substituted Cu-oxide including a superconducting phase having a structure substantially close to the orthorhombic-tetragonal phase transition of said composition" is still unclear as to whether " close" means physically "close" or structurally similar.

The examiner apparently is referring to claim 27 and as stated above Claim 27 has been amended to recite "structurally substantially similar" by which applicants "substantially close".

The examiner further states with out identifying a claim:

> The language "said alkaline earth element is atomically large with respect to Cu" still is unclear as to how the radius is measured and the degree of largeness.

The examiner apparently is referring to claim 30. Applicants respectfully disagree. The language clearly means that the alkaline earth is larger than the Cu. Any one of the measurements of size mentioned by the examiner would be means to make such a determination. This terminology is understood by a person of skill in the art. At page 78 of the book by Poole et al. there is a section entitled "Atomic Sizes". Pages 79-80 of Poole et al. has a table of ionic radii of selected elements . At page 78 Poole et al. states "Table VI-2 gives the ionic radii of the positively charged ions of various elements of the periodic table. These radii are useful for estimating changes in lattice constant when ionic substitutions are made in existing structures". (See Attachment I of applicants' response dated Nov. 28, 1997). It is clear therefore, that atomically large means that the alkaline earth is larger than Cu. Copper has two ionic forms each

with a different radius. The alkaline earths also have several ionic form and different radii.

The examiner further states:

> Claim 33 still is unclear as to whether the alkaline earth element is concentrated "near" to the copper oxide concentration or whether the degree of alkaline earth element concentration is " near" to the amount of copper oxide concentration. If the latter is the case, then it is unclear if the degree of concentration is in molar or weight percentages. The applicants purportedly "do not understand" this rejection, but the point remains that it is unclear whether "near" refers to spatial distance or relative amounts.

Applicants respectfully submit that the claim is clearly worded. The claim recites "the composition being comprised of a copper oxide doped with an alkaline earth element where the concentration of said alkaline earth element is near to the concentration of said alkaline earth element where the superconducting copper oxide phase in said composition undergoes an orthorhombic to tetragonal structural phase transition." That is the claim recites copper oxide doped with alkaline earth - the concentration of the alkaline earth

has a value near to that concentration which results in an orthorhombic to tetragonal phase transition. This is what the language of the claim says. Since it is within the skill of the art using routine experimentation to determine how much alkaline earth is need to be near to the phase transition, it is not necessary fo r the claim to recite a specific value.

The examiner further states:

> Claim 33 also still is unclear as to the "superconducting copper oxide phase" changes into the tetragonal structural phase or whether that "superconducting copper oxide phase" is found in a composition at the boundary between orthorhombic and tetragonal phases. The applicants purportedly "do not understand" this rejection, but the point remains that it is unclear how the composition "undergoes .... (a) phase transition".

Applicant submit that the language of the claim is clear. Applicants do not understand the Examiners comments. There is no boundary referred to in applicants claim. The Poole et al. book in Chapter 6 entitled "Crystallographic Structures" in Section B thereof entitled "Peovskites" describes various crystal structures: cubic form, tetragonal form, orthorhombic form , alternate tetragonal

form. In subsection 4 on page 85 entitled Phase Transitions states "[t]he compounds $(La_{1-x}M_x)CuO_4$ with M=Sr and Br are orthorhombic at low temperatures and low M content, and tetragonal otherwise." (See Attachment I of applicants' response dated Nov. 28, 1997) Sr and Br are alkaline earth elements. (See the definition of alkaline-earth metals from Hawley's Condensed Chemical Dictionary p 36 in Attachment J of applicants' response dated Nov. 28, 1997).

The examiner further states:

> It still is unclear to refer to metal oxide as being multivalent" or as having "multivalent states". The claims involved should be rewritten to more clearly set forth the fact that the metal, not the oxide, is multivalent or has multivalent states.

As stated above this is a term of art well understood by a person of skill in the art.

The examiner further states:

> Claim 64 still is indefinite because the term ''element" is unclear as to whether it involves an element other than copper and oxide. Both copper and oxygen are "elements".

The term "element " is clear, it is a "chemical element". There is no indefiniteness about this term.

The examiner further states apparently referring to claim 64:

> The language "distorted octahedral oxygen environment" also still is unclear as to what the 'environment'" is or how it is related to the composition. The applicants point to Attachment P which was published after the priority date afforded to the presently claimed invention and therefore does not reflect on the knowledge of one skilled in the art at the time the invention was made. Moreover, the term environment is unclear as to whether or not it is a crystalline lattice.

That Attachment P of applicants response data Nov. 28, 1997 was published after applicants filing date is not relevant since a person of ordinary

skill in the art knows what a distorted octahedral crystal structure is. The last sentence of section 4 on page 76 of Poole states "This same mec hanism is operative in the oxide superconductors." The first paragraph on page 73 states "Much has been written about the oxide superconductors compounds being of perovskite types, so we will begin with a description of the perovskite structure." It is clear that the distorted octahedral environment recited in claim 64 was a well know property of the perovskite type structure and not newly described in the Poole book.

The examiner further states:

> Further with respect to claim 96, that claim still is unclear as to whether the "copper-oxide compound having a layertype perovskite-like crystal structure" contains elements other than copper and oxygen. It is noted, moreover, that perovskite has the general formula AB03 wherein A and B represent metal atoms.

As stated above the language "copper-oxide compound having a layer-type perovskite-like crystal structure" is well understood in the art. Applicants were awarded the Nobel prize in 1987 based on their article which used this terminology. Their article was published about 8 months before their patent application was filed and the Poole book acknowledges this and uses this

terminology. This is clear evidence that persons of skill in the art understand this terminology.

The examiner further states:

> In view of the foregoing, the above claims have failed to patentably distinguish over the applied art.

No art has been applied in the office action. All of applicants claims are clearly definite under 35 USC 112, second paragraph and respectfully request the examiner to withdraw the rejection.

Applicants acknowledge that Claims 113, 114, 123, 124, 134, 135, 140, 185, 186, 190, 191, 197, 220, 221, 225 and 226 are allowed.

The Amendments After Final Rejection (submitted on the dates in the list below) submitted in the copending divisional application 08/ 303,561 which was filed on 9/9/94 are incorporated herein by reference since they relate to the same issues under 35 USC 112, first paragraph and second paragraph:

<u>November 25, 1998</u>:

<u>December 10, 1998</u>:

<u>December 11, 1998</u>:

December 15, 1998 (2 submitted):

December 15, 1998: [1.132 Declaration of James Leonard]

December 18, 1998:

December 22, 1998:

December 27, 1998:

June 14, 1999:

June 15, 1999 (2):

June 27, 1999:

These amendments provide additional patent and non-patented evidence that the terminology using "-like" and "-type" which the examiner finds not enabled or indefinite are in fact enabled and definite to persons of ordinary skill in the art at the time of applicants filing date.

In view of the changes to the claims and the remarks herein, the Examiner is respectfully requested to reconsider the above-identified application. If the Examiner wishes to discuss the application further, or if additional information would be required, the undersigned will cooperate fully to assist in the prosecution of this application.

Please charge any fee necessary to enter this paper and any previous paper to deposit account 09-0468.

If the above-identified Examiner's Action is a final Action, and if the above-identified application will be abandoned without further action by applicants, applicants file a Notice of Appeal to the Board of Appeals and Interferences appealing the final rejection of the claims in the above-identified Examiner's Action. Please charge deposit account 09-0468 any fee necessary to enter such Notice of Appeal.

In the event that this amendment does not result in allowance of all such claims, the undersigned attorney respectfully requests a telephone interview at the Examiner's earliest convenience.

MPEP 713.01 states in part as follows:

> Where the response to a first complete action includes a request for an interview or a telephone consultation to be initiated by the examiner, ... the examiner, as soon as he or she has considered the effect of the response, should grant such request if it appears that the interview or consultation would result in expediting the case to a final action.

Respectfully submitted,

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